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MONTCLAIR STATE UNIVERSITY

OPTICAL MISPERCEPTION AND SHAKESPEAREAN DRAMA

by

LISA CASTELLUBER

A Master's Thesis Submitted to the Faculty of

Montclair State University

In Partial Fulfillment of the Requirements

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Thesis Committee:

Thesis Sponsor: Dr. Naomi Liebler

Committee Member: Dr. Adam Rzepka

Committee Member: Dr. Lucy McDiarmid

Abstract

Shakespeare's appropriation of the scientific advancements of his contemporaries illuminates the interconnectivity of Renaissance science and literature. Heightened cultural interest in sensory deceptions, in particular deception of the sense of sight, frequently occurs in Shakespearean drama. The influence of optical inventions created a new perspective on an audience's sensory limitations. The limits of human sight as accurate access to the truth were stretched with anamorphic art. Optics as a scientific field dates back to the ancient Egyptians and the Mesopotamians, but when the Renaissance spread across southern Europe, humanism revisited this theory. This thesis will show the trajectory of this art form and its connection with science in order to illustrate their influence on Shakespearean drama.

The popularity of anamorphosis, the extensive use of perspectival illusion in art, indicates that optics were an influential element of English culture. As this thesis will demonstrate, Shakespearean drama exhibits the impact of advancements in the science of optics and particularly upon extra-scientific domains such as the theater. How we see, and how easily manipulated the sense of sight is, became an important focus of discourse within Shakespearean drama, which itself is an exercise in optical deception.

While there is evidence throughout Shakespearean drama to support my convictions that the new optical technological advancements influenced Shakespeare's writing, this study will examine representative examples from the comedies, as they are exemplary of the aforementioned influences, as well as one of the sonnets.

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Montclair, NJ

2014

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Optical Misperception and Shakespearean Drama

Heightened cultural interest in sensory deceptions, in particular deception of the sense of sight, was a critical social element in Renaissance England as it affected science, architecture, painting, and theater. A new awareness of optical misperception emerged in Shakespearean drama following the increased study of perspective. The influence of optical inventions created a new perspective on an audience's sensory limitations. In anamorphic art perspective played a significant role in the demonstration of artists' innovative creative abilities when the illusion of a distorted and unrecognizable image that appeared on a two-dimensional surface only resulted in a clear image if viewed from a particular angle (Habib 17).

Optics as a scientific field dates back to the ancient Egyptians and the Mesopotamians, and there is a record of a lens creation in 700 BCE (Guenther 631). However, when the Renaissance spread across southern Europe, widespread growth of humanism revisited the study of optics. A humanistic person lifestyle was well versed in language, literature, art, history, rhetoric, and philosophy. Someone with skills in these areas who could perform in each discipline with moderate expertise would be able to separate himself from traditional roles and embrace new ways of experiencing the world. Previously, the Holy Roman Church "had dictated European values throughout the Middle Ages [but the] breakdown of feudalism helped nurture the Renaissance ideals by creating stronger rulers who were more likely to challenge the Holy Roman Church" (Obstfelds 15). As a result of this more open culture, advancements in science and art grew exponentially in the Renaissance.

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Anamorphosis, a type of distortion of optical perception requiring a certain perspective to see the intended image, is another early art form that can be traced back to ancient Greek and Egyptian science but again was rediscovered during the Renaissance when scientists revisited the classics (Howard and Rogers 61). Anamorphic art and its connection with science display a significant influence on Shakespearean drama. Shakespearean drama exhibits the impact of advancements in the science of optics through plot complications that result from misperception or from accurate perception of a trick created by another character. Leonardo da Vinci's words about perspectival art are helpful to illustrate the point that analysis of art is ineffective without the knowledge of the science that helped to create it. He writes:

Those who become enamored of the practice of the art [of perspective], without having previously applied to the diligent study of the scientific part of it, may be compared to mariners, who put to sea a ship without rudder or compass, and therefore cannot be certain of arriving at the wished-for port. (qtd. in Campbell, *Scenes and Machines* 30)

Precise scientific thought and mathematical accuracy were needed in order to create anamorphic images. Anamorphosis required precise alignment of images on angles in order to create a final product that was in perspective when viewed from the correct vantage point. Since light rays travel in straight lines, the artist must create straight lines from a vanishing point through the distorted image in order for the images to appear proportional when viewed from its intended perspective (Topper 115). Anamorphic distortions suggest that seeing from a certain perspective is vital to properly comprehending a work of art. There is an underlying message hidden in an anamorphic

piece as a whole. Since Renaissance dramatic productions were created during a time of innovative popular art and new scientific advancements, they contain influences from anamorphic art, optical lenses and several different types of mirrors. The impact that these advancements had on Shakespearean plays is evident in the new perspectives added into drama through optical deception.

Science and rhetoric of the early modern world both pledged to show new inventions, and the theater was the perfect venue for such a demonstration (West 107). It is apparent that art was significantly influenced by architecture as well when one considers that “there was growing up throughout the period of the Renaissance a theory of scientific perspective based primarily on a careful study of the architectural remains of Roman antiquity and increasingly dependent on a knowledge of geometry” (Campbell, *Scenes and Machines* 28). Sebastiano Serlio addressed perspective with regard to stage scenery in 1545 when “we find most insistently emphasized the interdependence of architecture and perspective as witnessed by the studies and achievements of his predecessors and masters, Bramante, Raffaello, Peruzzi, Genga, and Giulio Romano” (Campbell, *Scenes and Machines* 32-33). Only twelve years later Euclid’s research on optics, published in 1557, assumes that “the rays proceed from the eye...[and] at the very end of the seventeenth century it was still deemed undesirable to look at stage scenery with two eyes, since the conflicting cones made by the rays emitted from the eyes were annoying” (Campbell, *Scenes and Machines* 31 n1). The research related to optics that was ongoing while Shakespeare was writing suggests the traceability of these elements in his drama.

It is also evident that paintings using specific perspectives were accessible during the time that Shakespeare was writing plays. For instance, if “The saloons and galleries of Leicester’s castle of Kenilworth, near Shakespeare’s birthplace, were adorned by portraits at full length or on smaller scale in the rich costumes of the period which Holbein had made fashionable” (Cust 5), it is likely that Shakespeare would have been familiar with Holbein’s work even if he had never seen it in person. He may have seen it in Whitehall “where, incidentally, the King’s Men often performed in the early 1590s” (Habib 28). Hans Holbein the Younger used optical artistic advancements when he painted the anamorphic *The Ambassadors* (1533) and demonstrated that *how* we see, and how easily manipulated the sense of sight is, is an exercise in itself in optical deception. These concepts of perspectival viewing and optical deception became an important focus of discourse within Shakespearean drama. Just how significant an impact this interest in optical deception had on Shakespeare cannot be identified with strict certainty, but “Ben Jonson lived long enough to write of English noblemen’s appreciation of Romano, Tintoret, Titian, Raphael, and Michael Angelo [, thus] It is clear that Shakespeare had seen pictures in collectors’ galleries” (Cust 6). Moreover, since Holbein’s popularity, anamorphic portraiture became the fashion, and it is likely that Shakespeare would have been exposed to art containing unusual perspectives like those in Holbein’s work.

The human subjects of Holbein’s *The Ambassadors* are French ambassador to England, Jean de Dinteville, and bishop of Lavaur, Georges de Selve. Both men are depicted leaning on two shelves filled with instruments of education and science such as a celestial globe, a terrestrial globe, a sundial, and an arithmetic book. The foreground of the painting is the most significant in conjunction with anamorphic art as it contains the

famous distorted skull that is only accurately seen when the viewer looks at the painting from a specific point to the right of the painting. The skull, in conjunction with the crucifix in the upper left corner of the painting signify the men's awareness of their own inevitable death (Kenaan 65). However, the background curtain is almost as important even though it was "prevalent convention in the Renaissance...[and] common in Holbein's work...the green curtain in the *Ambassadors* emerges as being quite distinct from any other background curtain painted by Holbein. We may observe that what makes this curtain singular in character is its theatricality, or better yet, its implied suggestion of a hidden reality behind-the-scenes" (Kenaan 65). This point demonstrates what Holbein might have been addressing in the painting. It seems that "the curtain suggests the presence of a depth itself" (Kenaan 67) beyond the perspective of the painting, which is relevant as this is always true for a theatrical performance. The plays themselves are performed on a stage, but the depth of the material and its relevance to the audience is far beyond what takes places on the literal stage. Just as Holbein was aware of the scientific advancements evident in the objects in his painting as well as the mathematics needed to create the anamorphic images, his work also displayed elements of the theater that echoed similar messages of awareness of one's level of perspective.

The paintings that were influenced by new scientific discoveries and showed an interest in optics in general also appear in Shakespeare's theatrical productions. In Elizabethan England, "Merely fanciful effects in painting were welcome...Among these ranked high certain paintings in perspective, a *tour de force* in which some painters were wont to practice their skill" (Cust 10). Shakespeare frequently references these

perspectives. For instance, in *Twelfth Night*¹ there is “A natural perspective, that is, and is not” (V.i.227). Orsino recognizes two people, but is confused by the optical illusion that appears before him: twins who appear to be brothers but are actually a brother and a sister disguised as a boy.

A look at the process of approaching anamorphic art is particularly helpful to understanding of how it would have affected its viewers and thus how it would have influenced Shakespeare’s theater. Riehl’s process is as follows: “1) traditional (centric) point of view; 2) unusual (often lateral) point of view; 3) return to the centric point in order to inscribe the discovered image, now hidden, into the visible picture” (149). Though this process is intended for viewing anamorphic art, it can be used to view Shakespearean drama from a new perspective in that there is a significant shift in focus from a traditional dialogue that suddenly contains optical misperceptions. The influential properties of optics on painting can be traced back to Alberti’s *Della pittura*. For instance:

The device of *perspective picture*—the sixteenth-century name for the visual composition that, in the seventeenth century, came to be called “curious perspective” or “anamorphosis”—originated in late fifteenth century Europe, coming on the heels of Leon Battista Alberti’s articulation of perspective painting in his influential treatise *Della pittura* (1435). (Riehl 143)

This explanation coupled with the idea that anamorphic images can only be appreciated when one’s point of view is changed and a new shape comes into focus is particularly

¹ Citations to Shakespearean plays follow the Arden Third Series with the exception of *The Comedy of Errors* and *A Midsummer Night’s Dream*, which are Arden Second Series publications.

complex when applied to drama. The change in viewpoint or perspective is explored in several of Shakespeare's plays. The revelation that the characters have occurs after they have seen the world around them from a new angle or after they have been tricked into seeing something that is not actually there.

Shakespeare writes about perspective frequently. Cynthia Lewis offers exemplars of pictorial elements in Shakespearean drama in regard to *Cymbeline*, which was printed after all of the plays that will be addressed here. As one of Shakespeare's last printed plays, it is appropriate that it seems to contain the most examples of misperception and of accurate perception that has been manipulated. The plays that will be addressed build up to the many uses of optical illusions present in *Cymbeline* and thus show how the interest in optics steadily wove its way into Shakespearean drama. Lewis writes, "it is various kinds of seeing—and not the many failures of sight—on which the play [*Cymbeline*] centers" (345). For instance, the picture of Fidele that is in Cymbeline's court is evidence that "the play continually toys with our expectations by inverting and distorting familiar pictures" (Lewis 348). This incomplete picture, as Lewis calls it when she attributes misperception to "Posthumus's misreading of Imogen's infidelity and Imogen's later error of taking Posthumus for dead" (349), first appears in *Othello* and in *Romeo and Juliet* when Othello misreads Desdemona's infidelity and when Romeo mistakes Juliet's sleep as death. *Cymbeline* seems to be the culmination of optical misperception as it pertains to behavior, which originated in Shakespeare's earlier plays. By this point in his career, Shakespeare had staged multiple plays that demonstrate "human sight is sorely limited" (Lewis 354). *Cymbeline* ends in a joyous ignorance of the breakdown of sensory perception and "chooses to stay in a 'fog'" (Lewis 356) much like the one the lovers in *A*

A Midsummer Night's Dream experience when they are also “oblivious to the unequivocal signs of...contempt for [one another]” (Lewis 356).

Shakespeare writes about optical misperception only once in the sonnets, as the study of optics seems to significantly influence only Sonnet 24.² In other places in the *Sonnets* Shakespeare alludes to portraits; see “painted counterfeits” in Sonnet 16 and “the counterfeit / Is poorly imitated after you” in Sonnet 53. Again in Sonnet 67 there is a “love’s picture” of “the painted banquet” on which the poet is feasting his eye. The word ‘eye’ is used in several sonnets, but it only has the matched meaning of a source of perception in Sonnet 24. Steven Mead’s research on perspectival art and its connection to Sonnet 24 brings to light the many instances in which Renaissance perspectival art can be tied to Shakespearean metadrama.

The revival of linear perspective after the Italians rediscovered the mathematical structure in the fifteenth century significantly influenced theories of sight and stage representation (Mead 228; see also Campbell’s *Scenes and Machines*). This literal interpretation of perspective was another element that appeared in Shakespearean dramatic productions. In its discussion of art, Sonnet 24 as a whole presents “a false interiority, both intellectually and morally flawed, created by perspectival painting” (Mead 233) which would have been an element that affected both the stage scenery and the abstract elements of the drama itself. Since the sonnet’s speaker, the poet, compares himself to a painter creating a masterpiece inside his heart, he emphasizes the effect of looking at a painting and remembering the person in it as satisfactorily as the artist once saw him/her. The speaker of Sonnet 24 criticizes a painter in the paradox “perspective

² Citations to the Sonnets follow the Arden Second Series edited by Katherine Duncan-Jones.

that it is best painter's art" (4). If perspective were the painter's best art then the subject in the final artistic product would be exactly the same as the subject itself, which is of course impossible since the painting is a recreation of a person. It is in the couplet that this criticism is further addressed: "Yet eyes this cunning want to grace their art / They draw but what they see, know not the heart" (13-14) because the eye is unreliable; it can only replicate the other's external elements in hopes of creating a similar image to the object of the painting. Thus, the image created by a painter is not a realistic one because it is not the true person present. This is similar to the method in which anamorphic images are created because they are not realistic when looking straight at the painting.

Anamorphic art contains unrealistic images of its subject, as the subject appears severely distorted when viewed head-on. The paradox of a disguised actor on stage is similar to the paradox of viewing a painting because a painting is two-dimensional and therefore it appears realist, but is only a representation of reality. The painting is not three-dimensional in the same way that a disguised actor portrays someone he is not (atop the obvious element of the acting itself). This multifaceted relationship is even further complicated in anamorphic art when the image at first appears unrecognizable and then once viewed from the correct perspective is clarified. The combination of paradoxical art and science is what seems to seep into Shakespearean drama as a result of the fascination that the popular culture had with optics. Many of his characters are disguised and therefore are pretending to be someone they are not, which causes quite a bit of misperception on the part of the remaining characters.

This fascination lends itself to reading the sonnets from different angles, quite literally. For instance, Ingram and Redpath's commentary on Sonnet 24 suggests that the

word “perspective” was meant to be read adverbially as if the angle of the viewer to the painting was critical to an accurate interpretation of the art (cited in Gibbons 129). That said, Shakespeare would in turn be suggesting that an optic glass would be required in order to see the beloved properly in the work of art that the speaker is figuratively painting. Therefore, “If ‘it’ is the image and ‘perspective’ is an adverb, the line would suggest that perspectival art can teach the viewer inner truth, and [that] this sense is a real possibility” (Mead 241). Without the sun that is the third element of the poem outside of the painter and his subject, the painting cannot be fully realized. In Sonnet 24, it is “where-through the sun / Delights to peep, to gaze therein on thee” (11-12) that the poet’s love is realized.

If we consider that Sonnet 24 may be read as an element of anamorphic art, “then the couplet removes us (as an audience is removed from the characters on stage) from the final despair of artistic failure” that troubles so many readers (Mead 244). The audience of a Shakespearean drama aligns with the third element of an artistic creation: as the sun illuminates the painting in Sonnet 24 so does the audience illuminate the dramatic production by viewing the performance and suspending its disbelief in order to see beyond the false representations that the actors use to portray a reality the audience knows does not truly exist. While this suspension of disbelief occurs during any dramatic production, it is particularly important during a production involving such dramatic irony as is present in Shakespeare’s comedies given the number of disguises present.

For a definition of perspective that helps to elaborate on anamorphic art, I turn to the artist Nicholas Hilliard: “For perspective, to define it briefly, is an art taken from or by the effect or judgment of the eye, for a man to express anything in shortened lines and

shadows, to deceive both the understanding and the eye" (qtd. in Thornton 71). The method by which Hilliard intended his paintings to be viewed is also aligned to the view that appears in Shakespearean drama. In the portraits of Queen Elizabeth, Hilliard positions the perspective in one point and thus the viewer's eyes are drawn out to nothing before they "will return to the subject in the foreground: the journey to the 'depth' actually causes the viewer to reject the 'back' of the painting in favor of the surface, to celebrate the idea over the image" (Mead 229).

Drama as a genre is open to the celebration of the idea over the image in that the idea is what the audience ultimately takes away from the performance. There is a certain alienation that the audience has from the visual spectacle at hand just as the characters must be careful not to trust only their eyes as access to the truth. The audience must willingly suspend its disbelief when it sees a man on stage representing a woman, a trap door representing hell, and a painted ceiling representing heaven. The idea is what the playwright presents to the audience; how this idea is achieved is significantly influenced by perspective, a concept that was clearly gaining and even peaking in popularity in the fields of optical art and scientific inventions related to optical misperception.

Shakespeare writes about perspective in nearly every sense of the word: sight as a source of truth, as a source of fabrication, as a method of trickery, as access to another element of the world in a different locale, just to name a few. In the comedies, sight cannot be trusted because of the extensive use of disguise: both in costume and through love potion. In the tragedies a character with selfish goals and a desire to destroy another character's life undermines the expectation of behavior among friends (see Jean-Pierre

Maquerlot³ for further analysis of these). It is the painful truth that natural eyesight is not always an accurate access to the truth, which makes Othello aware of his misperception of the complex world around him, albeit too late to undo the damage it has done. He has accurately seen the handkerchief, but his perspective has been distorted by Iago's lies and Desdemona is already dead.

In addition, the hypothesis that the science and art of the day influenced the theater is strengthened with the acknowledgement of the history play *Richard II* because the play's entire plot's premise is on the concept of the king's two bodies: natural, or mortal, and politic, or spiritual. The king, as a mortal, will die, but his legacy will live on forever. In *Richard II* Bushy discusses "perspectives, which rightly gaz'd upon / Show nothing but confusion; ey'd awry / Distinguish form" (II.ii.18-20) in conversation with the queen to try to comfort her after the king has left the country. It is evident that "depending on one's perspective...Richard is either a tyrant or a martyr, Bolingbroke either a patriot or a ruthless opportunist, York either the reluctant servant of an historical shift or a pusillanimous defector" (Forker 3). Before his death, however, Richard also encounters mirrors, which he looks into and then smashes (IV.i.290). In a way, Richard's self-centeredness helps him to avoid a reality of his own creation. The mirror is a metaphor that traces its way backward through the play through falsifications and shattering depending on the perspective of the character at hand. Ultimately, the shattered mirror connects Richard to his own tragedy, "helping to focus psychic conflicts between vanity and truth, face and mask, role and self, self-construction and dissolution, surface

³ *Shakespeare and the Mannerist Tradition: A Reading of the Five Problem Plays* by Maquerlot addresses optics in the tragedies *Julius Caesar*, *Hamlet*, and *Troilus and Cressida* as well as the comedies *All's Well that Ends Well* and *Measure for Measure*.

and depth, shadow and substance, illusion and reality” (Forker 75). The conceit of the mirror is extended as well throughout the play through York as the one who reflects on political policy and change in leadership from Richard to Bolingbroke. The queen diverts the attention she sees going toward Bolingbroke whenever possible. In the two mirror scenes (II.iv) and (III.iv) we see the truth of politics in the form of reflections. And just before Richard shatters the glass, he says, “O, flatt’ring glass, / Like to my followers in prosperity, / Thou dost beguile me” (IV.ii.279-81). His discussion of the mirror is two-fold: it is used for reflection and as an access to the truth of himself while it can trick him like some distorting mirrors might (Forker 75).

Just as “a man may see in a mirror how he changes and grows old, so he can see in histories ‘the form and figure of all Empires and common welthes’ and note their progress and decay” (Campbell, *Shakespeare’s “Histories”* 108). The poetry anthology *Mirror for Magistrates*, published in 1559, influenced much of the literature that Shakespeare and his contemporaries address. For instance, “Howe kyng Richarde the seconde was for his evyll governaunce deposed from his seat, and miserably mured in prison” (Campbell, *Shakespeare’s “Histories”* 110). Shakespeare’s use of optical inventions and artistic practices of optic manipulations in this history play underscore the tensions of the politics of his day in the same way that the use of these optical elements emphasize the need for a certain wariness when relying upon natural sight in the comedies. Richard wants to go to Ireland to check in on his troops, and the Nine Years’ War would have just begun in 1594 (see Morgan’s *Tyrone’s Rebellion: The Outbreak of the Nine Years War in Tudor Ireland*). *Richard II* quite literally mirrors the politics of the late sixteenth century in England. The tragedies reveal optical misperception differently

from the way the comedies and the history plays do because they address optical failure and misperception through dialogue. This brief analysis shows the cross-genre usage of optical misperception in Shakespearean drama. For instance, the word “perspective” (II.ii.18) in *Richard II* may reference the anamorphic painting of King Henry IV of France and his queen (Calderwood 78n1). William Scrot’s anamorphic painting of Edward VI dates to the early 1540s and was probably a source for this reference (Calderwood 78n1, n3). The painting of King Henry IV contains an anamorphic image of the king that cannot be seen accurately unless it is looked at “awry” as Bushy suggests. It is clear that this painting hung in Whitehall Palace in the 1590s at the same time Shakespeare’s company would have been performing there (Dowden xxviii). The painting “rightly gazed upon / show[s] nothing but confusion; eyed awry / Distinguish form” (II.ii.18-20) just as an accurate view of the Edward VI painting would have required an angled perspective. Nonetheless, the genre that fits optical misperception the best is the comedies as the confusion of the sense of sight through disguise appears most often in these plays.

The senses were the source of the truth during the Renaissance; therefore, one can speculate that Shakespeare created a confusion of the sense of sight through disguise and inaccurate optical perception so that his audience was asked to consider why this caused an inaccurate judgment of the truth. In *An Apologie for Poetrie*, Philip Sidney wrote that “comedy is an imitation of the common errors in our life” (44). His discussion of comedy as a genre suggests that it was used to place the audience in the minds of the characters and to “hold up a mirror” to the lives of the audience.

Perhaps the most obvious reason the comedies are the most appropriate genre for discussion of optical misperception is that disguise can quite easily translate into comedic scenes of confusion. The sense of sight was (and still is) easily deceived and was therefore a fitting topic to address in Shakespearean comedy—a genre that was accustomed to dealing with the cultural anxieties such as the ones expressed by Sidney. The comedies provide both comic relief and a more serious look into society's issues. When one considers the fact that human sight always requires accurate perspective in order to obtain truth, one can understand how particularly applicable anamorphosis is to the theater. A focus on optical misperception in Shakespearean drama tells us that the capability to perceive beyond what one actually sees through a countenance is challenging, but necessary in order to avoid misperception; the sense of sight cannot be trusted as it is quite easily misled. The plays that deal with the same types of optical misperception and accurate ocular interpretation of a manipulated scene are explored here so that the reader may discover how anamorphic art and optical inventions appear in Shakespearean drama.

Optical Inventions and Illusionist Art of the Renaissance

Renaissance scientists inspired new techniques in art while scientists and artists influenced innovations in theater. The extensive use of perspectival illusion in art contributes to the idea that sensory deception was clearly intriguing to Renaissance people, because it showed up in so many different aspects of Renaissance culture. The advancements that artists and scientists of the Renaissance made and how they were ultimately addressed in the theater are shown through deception in the comedies.

In *Hidden Images*, Fred Leeman gives many examples of how the development of anamorphosis, “an extreme example of [the] subjectivization of the viewing process [which is derived] from the Greek *ana* (again) and *morphe* (shape)...indicates that the spectator must play a part and re-form the picture himself” (9). This process of image distortion began on flat paper and developed into “the perspective cabinet or ‘perspektyfkas’” (Leeman 9) through manipulation of angles to create a seemingly large space on a flat surface. The painting inside the cabinet is distorted in perspective and appears to be the size of an entire room when it is only a flat back of a cabinet wall. This type of art causes the viewer to question the space of the painting. It is deceptive and requires the audience to actively participate in order to experience the room that cannot possibly exist on a two-dimensional surface; the viewer cannot use reasoning alone to experience the painting accurately. The viewer must deem the painting just one approach to seeing the world and possibly acknowledge that his or her own world requires seeing things from a different perspective in order to be understood properly.

The Renaissance challenges faced by fresco painters who were asked to create a unified image on both walls and ceilings were solved when Paolo Uccello designed a

wall painting that went from wall to ceiling in one flowing image. He used distorted images to make the different surfaces appear flush. The most prominent early example “of this illusionistic scenographic architecture is Andrea Palladio’s last work: the *Teatro Olimpico* [emphasis added] in Vicenza” (Leeman 73), which expanded this idea further onto a more complex surface.

Through the study of Shakespearean plays, one should be able to trace the scientific inventions that changed the Elizabethan culture and particularly the art that evolved from these scientific inventions. It seems that the appropriate place to begin this analysis is with the senses as they are frequently used as a source of access to the truth in Shakespearean drama. The focus here will be the sense of sight in particular because it is the sense related to optical misperception, and because “sensory perception—the act of seeing, hearing, smelling, tasting, or touching—is as much a cultural action as it is physical” (Classen 1). Collectively, literary critics and anthropologists contend that the sensory history available to us proposes a distinctive method of interpreting both Renaissance science and drama (Dugan 728). Dugan notes that “Aristotle and Plato, for example, were among the first proponents of vision’s predominance” (731) over the other senses.

There was a large gap in time between the invention of eyeglasses and the invention of the telescope—both of which aid the user’s eyesight (Ilardi 317). Vasco Ronchi’s research reveals that because lenses deceive, they were excluded from scientific research. Mathematicians and philosophers pronounced that

The purpose of sight is to know the truth; glass lenses show images larger or smaller than the real ones seen without lenses; they show objects nearer or further

away, at times even upside-down or distorted and iridescent; therefore they do not show the truth; hence, we must not look through lenses, if we do not want to be deceived. (Lindberg and Steneck 29)

Sight was considered unreliable because of how frequently one could encounter optical illusions, but the scientific progress of the Renaissance largely expanded the limitations of human sight to ensure that it could also be used to accurately perceive. There were misperceptions present in “the bent stick at a water surface, the mirror image apparently lying behind the mirror, the distorted image quite different from the real object, and so forth” (Lindberg and Steneck 30). The awareness of these optical illusions along with medieval philosophers’ lack of theory in vision prevented the invention of an optical instrument that helped one’s perspective of the world broaden for centuries; this invention was the telescope. Ronchi’s theories suggest that vision must be less effective than the sense of touch because it is less trustworthy and thus needs reason to correct it (Lindberg and Steneck 33). Whether another sense is necessary for effectiveness or reason is the correct aid in accessing the truth originally obtained through the eyes, theories on the unreliability of the sense of sight date back to Euclid’s *Optics*, a treatise on perspective (Burton 357). This is why the advancements in optics like the telescope and the use of perspective tubes to view anamorphic art were so intriguing—they were extremely innovative and addressed optics, which had been a source of unreliability for years.

The science available to Aristotle and Euclid, even though it was the foundation for future scientific inventions like the telescope, would not have allowed them to stipulate that the sense of sight could be manipulated to the degree that the Renaissance

saw it manipulated. For instance, “there were, indeed, numerous types of trick pictures, lenses, prisms, and distorting mirrors which were included by the generic term [perspective]” (Shickman 217). Therefore, it is not surprising that in the study of such an age of innovation “Two dominant themes structure the recent work on sight and Shakespeare—audience perception and visual spectacles” (Dugan 731).

The art of performance highly engages the sense of sight; thus it is no surprise that studies of sight and Shakespearean plays frequently address the link between the eye and the truth—or the eye and untruth even though they do so separately. Reading Shakespearean plays within the context of sight as an easily distorted sense brings sight studies and theater together. The connection between the sense of sight and accurate access to the truth was bent once the science was available to disprove ancient beliefs like that of a geocentric solar system with the introduction of a heliocentric one (Greenblatt, *The Swerve* 87). If sight, with the aid of the telescope, proved that Earth revolved around the sun and not vice versa, then sight provided accurate access to the truth. Still, hesitation remained. Even though science was advancing at an extremely rapid rate, the idea that sight could be trusted was not initially widely accepted. During the late sixteenth century and early seventeenth century, there was “a great variety of perspective glasses, testimony to the fascination that dioptrics [light refraction by lenses] and catoptrics [light reflection and image creation through mirrors] held for the investigative minds of scholar and magus” (Shickman 219). For instance, in *The Vanity of the Arts and Sciences* written in 1533, Heinrich Cornelius Agrippa von Nettesheim wrote, “experiments with mirrors and lenses were ‘daily seen,’ and listed an impressive variety: ‘Hollow, Convex, Plane, Pillar-fashion’d, Pyramidal, Globular, Gibbose, Orbicular, full

of angles, Inverted, Everted, Regular, Irregular, Solid, and Perspicuous” (qtd. in Shickman 219).

These optical experiments were extremely popular; therefore it is no surprise that Shakespeare manipulates senses through disguise and plot elements and appeals to the audience’s desire for spectacles and optical illusions on stage. He uses character disguises as one aspect of sensory deception as well as plots with identical twins. He has a forest where magical elements like love potion can make men love women they formerly despised and fairies love both kings and deformed men. It is clear based on the sheer number of plays that include optical deception that this was a popular element that the audience enjoyed witnessing at the theater. This new way of observing the world is illustrated in the many elements of optical misperception in Shakespearean drama. At its foundation, observation is human access to the world around us.

The sense of sight has always been an incredible access to what humans *want to believe* is the truth. In fact, the eyes were once accepted as a conduit of all visual knowledge (Sider 257). When da Vinci was dissecting eyeballs, he realized that the external image that is transmitted onto the retina was inverted. The Renaissance discovery “that the eye was a receptor for images rather than a projector [that Aristotle originally claimed]” (Sider 257) underscored the significant scientific changes that occurred during the time period. And yet eyesight was only one element to truly understanding the world. Through the sense of sight, the human mind knew it was being deceived; for instance, when it was looking at an anamorphic painting or a stick in water which appeared bent but once removed was straight again, the mind was willingly tricked

into optical misperception. The eye was tricking the mind and the audience was aware of this deception.

In addition to amenable misperception, there were concerns about actual misperception as well when a person could not accurately see what was before him or her. The invention of eyeglasses in 1287 by Salvino degli Armati was the start of great optical discoveries, but the Middle Ages were uncertain about the trustworthiness of something that distorted vision, even though it benefitted the wearer. Alessandro della Spina is said to have made use of Salvino degli Armati's invention when he invented eyeglasses made with convex lenses to fix nearsightedness instead of using trial and error until the correct pair could be found (Bunch and Hellemans 127). Convex lenses on glasses were one invention that resulted from the humanist way of thinking during the Renaissance. Again, the wearer acknowledged that the lenses were bending light, but was finally able to accept this shift of distortion as a positive discovery.

The continued study of optics led to the research of Johannes Kepler, credited as the founder of modern optics, and the first person to create an accurate description of how humans see (despite the cost to his own personal life). It is this kind of risk-taking that ultimately resulted in positive reception of the usage of optical misperception in art forms. In a letter to Galileo on October 13th, 1597, Kepler discussed the concept of "if" that is particularly relevant to the discussion of perspective because it addresses the same image viewed from two separate angles. He gave Galileo a list of latitude and longitude observations on different dates to prove that "if, as I wish, there would be shown a difference between the two observations of one or another minute or even 10' to 15', this would be proof of something of great importance for all astronomy" (Obstfelds 136).

The distinction that Kepler wished to uncover would have supported Galileo's claim to overturn Ptolemy's theories about Earth as the center of the universe. This mindset is also an avenue into a way of viewing anamorphic art. The shift in observations from one perspective to the next, even if it is only by a few degrees, can create a clearer image in proper proportion and allow the viewer to see the distorted image as it was meant to be seen.

Galileo was not the only scientist questioning the current state of optical awareness and plain sight as the only real source of truth in the world. Thomas Harriot's discoveries began where Galileo and Descartes elaborated and concluded. Harriot "constructed the largest telescope in England, observed sun spots, sketched the lunar surface, observed satellites of planets, proposed that planets moved not in perfect circles but in elliptical orbits, worked on mathematical cartography, discovered the sine law of refraction, and achieved major breakthroughs in algebra" (Greenblatt, *The Swerve* 239). Unfortunately, Harriot was not recognized for any of these accomplishments during his lifetime because they were not found until after his death. All of these discoveries uncovered through optical inventions demonstrate the effect that optics had on science during the Renaissance.

Throughout this discussion of Renaissance scientific advancements, artistic experimentation, and cultural fascination with optical illusions, several Shakespearean plays will be used to illustrate the interest in optics, optical studies, and optical illusions. There will be a focus on the concept of misperception, the intentional deceptions of the sense of sight, and shifts in optical perspective. Additionally, it is important to remember that even without "explicit references to perspective, seeing, or painting, a text may

nevertheless operate according to the rules of anamorphic logic and rhetoric” (Riehl 146). These instances are often seen in *A Midsummer Night’s Dream* in particular when anamorphic discovery is used to demonstrate to the audience that a new perspective is often needed in order to access the truth of the world around us but is not expressed overtly. Ultimately, in the comedies, when all has been restored to peace at the end of the plays, a lesson has been learned both on the part of the characters as well as the audience members. There is an “imperceptibility of structure, and then...an intelligible form: an approach that parallels epistemological premises of anamorphosis” (Riehl 147) so that when one has the correct angle or point of view, he or she can see the end result of peace as the comedies demand or the destruction as the tragedies require. New scientific advancements like the aforementioned lens bending and artist experimentation such as anamorphic art demonstrate that sensory deception interested Renaissance scientists and artists while Shakespearean theater shows how optical illusions captivated Renaissance audiences as well.

An Introduction to Optics in Select Shakespearean Plays

The deception of the sense of sight, intriguing as it related to optical illusions, was also very relatable for Shakespeare's audience if they considered the possibility of the plot of *The Comedy of Errors* outside the venue of the theater. As his earliest play, *The Comedy of Errors* and twin brothers' sight deception initiates Shakespeare's career as a playwright. The brothers' frustration with their servants is solely based on the confusion caused by both of their identical outward appearances. The connection that the audience could make to their own relationships while watching *The Comedy of Errors* was the confirmation that eyesight was quite easily misled. As Shakespeare's plays became more complex, they included more elements of optical misperception. The influence of optical inventions created a new perspective on Shakespeare's audience's sensory limitations.

The comedies *A Midsummer Night's Dream*, *The Merchant of Venice*, and *Twelfth Night* are indicative of the optical deception present in Shakespeare's drama because they are symptomatic of misperception in its basic form: misrepresentation of sight or a source of fabrication. The optical misperception associated with "recurring tropes of disguise, or of two bodies who claim the same name, or of indistinguishable twins...were central to the performance of a comedy" (West 103).

These four comedies exhibit instances of characters experiencing optical misperception or viewing it in a piece of art. Through the tragedy *Othello*, however, the characters discuss the occurrence of optical deception overtly in dialogue with one another. It seems that optical deception is most illuminated through the tragedies because the main character in each play deals with the challenges associated with duplicity of sight. It is through the tragedies that the characters must discover the misperception but

are unable to do so before it is too late, leading to their demise. The disguise in tragedies is always a manipulation of perception with a specific objective in mind. What comes to mind immediately is Iago's manipulation of Othello's perception of Desdemona's handkerchief in *Othello*. Othello believes Iago, but has nothing but "ocular proof." Again the eyes have been misled by deception and "ocular proof" is therefore inaccurate. In the comedies optical misperception is used in a more lighthearted fashion as a source of comedic relief or explanation for a plot twist in order to drive the main plot to its dénouement, but optical misperception in the tragedies reveals the main character's internal weakness. In *Othello*, this is Othello's trust in his "best friend" Iago who betrays him through optical manipulation. The usage of optical misperception is in some cases a functioning of the viewer's inability to see the truth because he is being tricked (as in disguise) and in others dependent on the perception of other characters' behavior (as in an actual visual change like Bottom's).

Confusion in *The Comedy of Errors*

The play *The Comedy of Errors* is full of optical deception, and the second scene of Act I, the first time in the play where misperception is found, is the first indication that Shakespeare used optical illusions to force his characters to use a new perspective when viewing the world around them. Antipholus of Syracuse has sent Dromio of Syracuse to the Centaur where the two will be staying for the night and has instructed him to “stay there, Dromio, till I come to thee” (I.ii.10). He is not expecting to see Dromio again until dinner. Suddenly, Dromio of Ephesus, Dromio of Syracuses’s identical twin, conveniently runs into Antipholus of Syracuse causing Dromio of Ephesus to misperceive Antipholus of Syracuse as Antipholus of Ephesus. Antipholus beats Dromio because he thinks Dromio is lying about not knowing about the money Antipholus gave him. He says, “There, take you that, sir knave!” (I.ii.92) out of anger. This monetary confusion continues when Antipholus of Syracuse converses with his own servant, who is unable to relate to the conversation about the missing gold, because he was not present for it originally. Dromio of Ephesus is also confused because he is asked, “How chance thou art return’d so soon?” (I.ii.42) as he has been looking for Antipholus of Ephesus who he now believes is in front of him. Antipholus of Ephesus is in trouble with his boss’s wife because her husband hasn’t come home for dinner and it is his responsibility to call his boss home. The confusion quickly escalates because Antipholus of Syracuse has given his servant a sizable amount of money for a room for the night and Dromio of Ephesus understandably knows nothing about this money. He refers only to “sixpence that I had o’ Wednesday last” (I.ii.55). Antipholus of Syracuse is “not in a sportive humour” (I.ii.58) when a large sum of money is concerned and wants to know “Where is

the gold I gave in charge to thee?" (I.ii.69-70). Dromio of Ephesus's outward appearance clearly confuses Antipholus of Syracuse and the conversation gets quickly tangled in their two different understandings of the circumstance in which they find themselves. Antipholus of Syracuse is already on edge because of the reputation of the town of Ephesus as one with "nimble jugglers that deceive the eye, / Dark-working sorcerers that change the mind, / [and] Soul-killing witches that deform the body" (I.ii.98-100). He believes his servant has run into these mischievous folk and that they may have taken advantage of his servant.

The opening of Act II continues the optical misperception as Adriana is waiting for her servant and husband's return for lunch. Luciana spots Dromio of Ephesus from afar and says, "Here comes your man, now is your husband nigh" (II.i.43). Unfortunately for Adriana, Dromio of Ephesus brings the news of a seemingly deranged husband who says, "I know not thy mistress" (II.i.68). The confusion on Dromio of Ephesus's part demonstrates his misperception of Antipholus of Syracuse. Identical twins can easily be confused by strangers, but even as a friend, Dromio of Ephesus's lack of knowledge that Antipholus of a Egeus even has a twin, heightens the sympathy one has for Dromio of Ephesus. Just as one might look upon a star for the first time through a telescope or at an anamorphic image in a painting, the confusion thus far in *The Comedy of Errors* stems from the optical deception caused by both Antipholus' and Dromios' outward appearances. A telescope brings the moon and the stars closer to the viewer through its lens, therefore causing the viewer to gain access to a part of the universe that he/she would never be able to reach through the naked eye. In the same light, the observer of an anamorphic image cannot appreciate the message of the painter or the clarity of the

distorted image until he/she is literally shifted to a new perspective and the image becomes clear. In the same way, confusion inevitably continues in the play until the misperception is amended.

As addressed previously, upon his arrival in Ephesus, Antipholus of Syracuse is uncomfortable with his surroundings: "They say this town is full of cozenage, / As nimble jugglers that deceive the eye" (II.ii.97-98). He refers to an illusionist or even witchcraft, because it seems he has heard that Ephesus might contain these "liberties of sin" (II.i.102) that deceive the senses. The tension between the characters rises as the deception of the sense of sight becomes more complicated. Adriana scolds Antipholus of Syracuse, because her husband, or the man she has been deceived into thinking is her husband, denies her as his wife. He responds, "Plead you to me, fair dame? I know you not" (II.ii.147). He is clearly confused as to why he is being reprimanded. Antipholus of Syracuse wonders, "What error drives our eyes and ears amiss? / Until I know this sure uncertainty, / I'll entertain the offer'd fallacy" (II.ii.184-86). His awareness that he is being misunderstood makes him want to discover the cause of this seemingly sensory fallacy. He requires a new perspective in order for the distortion to be corrected. Just as in *A Midsummer Night's Dream* when Bottom believes he is an ass, Dromio of Syracuse believes he is "transformed, master, am I not?" (II.ii.195) and then says, "'Tis so, I am an ass, else it could never be / But I should know her as well as she knows me" (II.ii.201-02). Optical deception can be an alarming experience if one is not aware of the deceit. The advantage that telescope users and admirers of anamorphic images have is that they are aware that their eyes are being tricked and that they must either acknowledge that the lens is helping them see the sky more closely or that the new viewing angle with which to

see the image provides much desired clarity to correct the optical deception. In the case of the comedies, the characters' obliviousness to the deception that is before them is what creates the type of tension seen in *The Comedy of Errors*.

Dromio of Ephesus wants to use the marks on his body as proof that Antipholus of Ephesus "beat [him] at the mart" (III.i.12) and says, "Your own hand-writing would tell you what I think" (III.ii.14). He tries to use eyesight as a form of proof that he was beaten, but Antipholus thinks he's crazy and does not accept his pleas. When a knock is heard at the door and Dromio of Syracuse opens it, Antipholus of Ephesus wants to be let into his own home. Upon refusal, he requests the name of the porter, to which Dromio of Syracuse replies, "my name is Dromio" (III.i.43). Dromio of Ephesus's frustration is clear when he says, "O villain, thou has stol'n both mine office and my name" (III.i.44). Luciana tries to plead with Antipholus of Syracuse who she believes is Antipholus of Ephesus by saying, "'Tis double wrong to truant with your bed, / And let her read it in thy looks at board" (III.ii.17-18). Here she actually requests that Adriana's husband deceive his wife to her face if he's going to cheat on her behind her back. Again since this is not Adriana's husband, Antipholus of Syracuse admits his confusion at Luciana's "gross conceit, / Smother'd in errors" (III.ii.35). She does not believe him and says, "It is a fault that springeth from your eye" (III.ii.55). The conversation only escalates in confusion when Antipholus of Syracuse hits on Luciana and says in response to her accusation: "For gazing on your beams, fair sun, being by" (III.ii.56). Luciana's defensive reaction speaks both to her loyalty to her sister and to her subconscious understanding of this optical deception: "Gaze where you should, and that will clear your sight" (III.ii.57). If Antipholus of Syracuse were able to look where he should, at his own

servant, then his sight would be cleared. Since he cannot, he believes that “There’s none but witches do inhabit here, / And therefore ’tis high time that I were hence” (III.ii.155-56). Just as he is saying he is ready to leave, Angelo comes to give him a chain, which Antipholus of Syracuse swears he “bespoke it not” (III.ii.170). Angelo experiences his own optical deception here when he clearly confuses Antipholus of Syracuse as Antipholus of Ephesus. Frustrated, he responds, “Not once, nor twice, but twenty times you have” (III.ii.171). Upon Angelo’s request to give up the chain, Antipholus of Ephesus says, “You gave me none; you wrong me much to say so” (III.iv.66) further supporting Angelo’s earlier deception. When Dromio of Syracuse tries to give Antipholus of Syracuse the gold coins he has, Antipholus of Syracuse becomes quite alarmed. He says, “The fellow is distract, and so am I, / And here we wander in illusions— / Some blessed power deliver us from hence!” (IV.iii.40-42). The shift in the tone of the conversation demonstrates the anxiety that the confusion has caused both men.

Later in the play, Adriana angers her real husband, Antipholus of Ephesus, when he is accused of going mad, because he claims he did not eat with his wife Adriana that day. He says:

Did this companion with the saffron face
 Revel and feast it at my house today,
 Whilst upon me the guilty doors were shut,
 And I denied to enter in my house? (IV.iv.59-62)

Adriana recounts the day’s events to her husband to persuade him to believe that what she says she saw was true: “He came to me and I deliver’d” (IV.iv.86) the purse of ducats. Luciana defends Adriana’s sight: “And I am witness with her that she did”

(IV.iv.87). The brothers' countenances are identical, and thus the reliance on mere natural sight has caused her to confuse her own husband with his brother. Antipholus of Ephesus is irate and says to his wife, "But with these nails I'll pluck out these false eyes / That would behold in me this shameful sport" (IV.iv.102-103). He knows that he must either be currently deceived or have been deceived during the day; or else, he is crazy.

Amidst the commotion, the group seeks optical clarity from the courtesan. The courtesan describes the incidents of the day in which she acknowledges Adriana's husband had once had in his possession a chain and a ring. Adriana's reply is not one of optical misperception, but of accurate perception of the lack of the jewelry. She says, "It may be so, but I did never see it" (IV.iv.139) and she "long[s] to know the truth hereof at large" (IV.iv.141). She does not trust her eyesight as access to the truth. Although the man Adriana saw was not wearing the chain or ring when she saw him, her lack of trust in her eyesight is important. She acknowledges that "A most outrageous fit of madness took him" (V.i.139), but is unaware that the cause of this supposed madness was the lack of accurate optical perception. When Egeon suggests that his ears are his "old witnesses, I cannot err" (V.317) and that he believes he hears his son, Antipholus of Ephesus says that he has never met his father. The sense of sight cannot be trusted here.

Adriana confirms that she is a victim of optical deception when she says, "I see two husbands, or mine eyes deceive me" (V.i.331). Duke Solinus recounts the story of Egeon and Emilia's two sons and the tragedy at sea which separated them. Emilia confirms that she did have two sons and that the duke's story is accurate. Duke Solinus demands that the twins "stand apart, I know not which is which" (V.i.364). It is clear that his apprehension stems from the uneasiness caused by his optical deception. At Emilia's

relief of the “heavy burden ne’er delivered” (V.i.402) until today, all is well again.

Dromio of Ephesus acknowledges the resemblance he and his brother have when he says,

“Methinks you are my glass, and not my brother” (V.i.417).

The Comedy of Errors is the first comedy to illustrate the complex level of confusion that can be created by optical deception. The two sets of twins are confused by all who know them, but once the cause of the misperception has been revealed, the new perspective that all of the characters have allows everyone in the play to see clearly.

Optical Mystery in *A Midsummer Night's Dream*

Shakespeare's comedies draw attention to the conditional practice of using sight as access to the truth. Sight can be accurate if one is wary but it can be so easily fooled that if one is not careful, one will be deceived. Instances of the consequences of this type of confusion are evident in *A Midsummer Night's Dream*.

Perspective comes into play early on in Act I. For instance when Hermia says, "I would my father look'd but with my eyes" (I.i.56) and then when Theseus replies, "Rather your eyes must with his judgement look" (I.i.57). Although this is not a misperception on Hermia's part, it is one on her father's end. Had he been able to see the situation from Hermia's perspective, he would have realized that she and Lysander were right for one another. Again when Helena is speaking to Hermia about why Demetrius loves Hermia instead of Helena, Helena says, "My ear should catch your voice, my eye your eye" (I.i.87). She wishes that she could literally look the way Hermia does so that Demetrius's perspective on Helena would shift. Luckily for Helena, Demetrius does fall in love with her eventually, but only after the love potion has been effective and he is deceived into thinking Helena is attractive. Oberon asks Puck to "Fetch me that flower; the herb I show'd thee once. / The juice of it, on sleeping eyelids laid, / Will make or man or woman madly dote / Upon the next living creature that it sees" (II.i.169-72). It is this flower that causes optical deception that allows Demetrius to fall in love with Helena. This would not be a comedy, though, if this shift in perspective happened without any confusion. Puck confuses Lysander as Demetrius because they both were Athenian men with an "Athenian woman by his side" (III.ii.39). The optical deception from the flower's love potion causes Lysander to say, "Content with Hermia? No. I do repent /

The tedious minutes I with her have spent” (II.ii.110-11). Here the shift in perspective is not made by a realization from the point of view of Lysander, but rather from an outside source: Puck. Oberon realizes Puck’s mistake when he states, “this is the same Athenian” (III.ii.40) and Puck replies, “This is the woman, but not this the man” (III.ii.42).

When one contemplates the phenomenon that human sight always requires accurate perspective to obtain truth, it is easy to understand how particularly applicable anamorphosis is to *A Midsummer Night’s Dream*. *A Midsummer Night’s Dream* addresses the theme of optical deception throughout the play. When “Presented with the obscurity of a tricky form, viewers are compelled to seek disclosure first through physical movement, and later through corresponding mental effort as they ponder the meaning of their discovery” (Riehl 143) as in the two sets of lovers’ confusion after awaking from the love potion that put them into a deep sleep. It seems impossible that Demetrius could love Helena given the way he treats earlier in the play and given the fact that he asks her, “do I not in plainest truth / Tell you, I do not, nor I cannot love you?” (II.i.200-01). It is as if Shakespeare takes them out of the scene to be transformed through their sleep in the forest and they are then revealed to be back to their true form once their perspective has changed. This is particularly true because they end up on the outskirts of the forest instead of in the middle of it where trickery by the fairies is common. They are once again in the realm of the law of Athens away from the fairies, but they have been transformed by their experiences in the forest. The audience and the characters both “search for the advantageous viewing point [which] demands an exercise of perceptions that compromise a linear advancement from mystery to revelation” (Riehl 143). Demetrius awakens and says, “These things seem small and undistinguishable, / Like far-

off mountains turned into clouds" (IV.i.186-87). He means that what he has experienced in the forest, namely being put under a spell and fighting with Lysander seem distance and out of proportion. How could he have fought with his best friend over a woman who he does not even love? These events do not seem in perspective given his happiness as he awakens. At the culmination of the anamorphic scene, the four lovers have completed the anamorphic cycle of the dramatic production because they have been transformed, changed, and are accessing their own truths through a new perspective. The product of the "anamorphic journey is enrichment rather than contradiction" (Riehl 149). The lovers have been enlightened by their experiences in the forest even though the process of getting to this resolution makes them feel dazed. After all of the characters admit their inability to see the events of the night before clearly, they are conceded renewed and accurate sight.

An example of this revelation can be found when Oberon's love potion deceives Titania so that Oberon may steal the changeling boy. Although the love potion is not a result of a technological or artistic invention of optics, it is a metaphor for the common misperceptions for which the sense of sight is responsible. These events in the play are "metaphors [which] can function as an historical archive of sensation [because]...they reveal how individuals react to cultural and physical events" (Dugan 728). This indicates the cultural reaction to optical inventions that distort the perspective of the naked eye and also speaks to anamorphic elements, which require a literal new perspective for accurate interpretation. The concepts within the new technological advancements of science and capabilities of sight like concave and convex lenses and early models of the telescope clearly intrigued Shakespeare's audience.

After Titania escapes from the spell of the love potion and acknowledges that she was dreaming of being in love with an ass, Oberon is willing to “undo / This hateful imperfection of her eyes” (IV.i.62-63), but not out of the kindness of his own heart; it is in return for the Indian boy. With regard to angles and anamorphic art, Calderwood suggest that “Titania’s disgrace, reflected in the flouriets’ weeping eyes, moves him to pity; and if pity depends on taking the perspective of others, of feeling what wretches feel, then Oberon’s own vision has been modified for the better” (72). Perhaps it is Oberon’s new appreciation for Titania after laughing at her while she was in love with Bottom that allows him to see their relationship from a new perspective.

Anamorphic art exposes the flaws in our own seemingly accurate perception. We acknowledge that the skull in *The Ambassadors* is difficult to see head-on, but we do not address the other elements of the painting that should disturb us “until anamorphism or some other perversely artificial device gives away the game” (Calderwood 73). In *The Ambassadors* the disturbing elements might be the crucifix in the upper left corner, the celestial globe, the two types of sundials (Kenaan 63). The anamorphosis in the play is indicative of the reality that the revelations upon the return to the city of Athens at the end of the play now have to be intertwined with their real lives. This elated love that they are experiencing is false and since the fairies remain in the scene at the end of the play, there is foreshadowing that the trouble that the lovers have faced has only just begun. Just as a person viewing *The Ambassadors* should be alarmed much more by the images not in anamorphic distortion, the audience of *A Midsummer Night’s Dream* should recognize that the new perspective with which the lovers view the world around them is not

necessarily one of peace if one considers the means by which they achieve this new perspective.

It is evident that the sense of sight is easily manipulated and has been distorted to an irreversible state by the end of the play. However, perception does not only involve the sense of the sight but is a multi-sensory experience. Therefore “a number of critics have begun to approach Shakespearean sensation through the concept of synesthesia...where stimulation of one sensory pathway leads to stimulation of a second pathway” (Dugan 734). In *A Midsummer Night's Dream*, Bottom describes his dream through multi-sensory confusion. He seems to have quite a bit of sensory experience that he would like to address, but lacks the ability to explore these experiences.

Bottom wakes up from having dreamed that Titania fell in love with him. He does not know what to make of this evidently impossible circumstance: “The eye of a man hath not heard, the ear of a man hath not seen, man's hand is not able to taste, his tongue to conceive, nor his heart to report what my dream was” (IV.i.204-07). He is upset that his friends have abandoned him and confused by what he believes must have been a deception of his senses, because “Me thought I was—there is no man can tell what” (IV.i.202). Bottom is unable to formulate words to explain his dream, but his friends tell him, “Bless, thee Bottom! Bless thee! Thou art translated” (III.i.113-14). Although Puck is able to fix his love potion mix-up with the other pairs of lovers that he “poisons,” Bottom was transformed more permanently. He cannot revert back to the person who did not experience Titania falling in love with him. He cannot return to the original perspective with which he viewed the world just as a person who has looked into

a telescope cannot return to the view of the world as he/she knew it before the stars and moon were in clearer view.

The character of Puck is significant when referring to anamorphic elements in the play, because he is an embedded outsider and spectator of all events that go on in the forest even though he does play a role in the mischief; it is Oberon's potion, not Puck's. Puck is able to mingle among the animals, the fairies, and the humans. In this sense, the deception created a desirable outcome. His role, "much like an anamorphic process of discovering something from the eccentric point of view and then attempting to make sense of it, profoundly alters the audience" (Riehl 151). Theseus, as the ruler in the story, must acknowledge the anamorphic elements of the four lovers that he finds on the outskirts of the city of Athens in order for the experience to be viewed from the correct perspective:

The lunatic, the lover, and the poet
 Are of imagination all compact:
 One sees more devils than vast hell can hold;
 That is the madman: the lover, all as frantic,
 Sees Helen's beauty in a brown of Egypt:
 The poet's eye, in a fine frenzy rolling,
 Doth glance from heaven to earth, from earth to heaven;
 And as imagination bodies forth
 The forms of things unknown, the poet's pen
 Turns them to shapes, and gives to airy nothing
 A local habitation and a name. (V.i.7-17)

Theseus' revelation above is that the poet, crazy as he may be, is able to create something out of nothing. This is essentially what an anamorphic painting does and what the dioptrics, the study of light refraction, does. It is what a telescope does through different size lenses. They all create a comprehensible image from something otherwise incomprehensible. They give the audience a new perspective with which to view the world.

Theseus, for whom Bottom performs his play with the other rude mechanicals, suggests that the best way to enjoy a play is to willingly suspend one's disbelief. This skill must be called upon whenever one is watching a performance, but its function is heightened when the play requires the audience to follow along with the characters' seemingly impossible new perspective at its culmination. In addition, Theseus's lines are clearly a glimpse into the mind of Shakespeare as he dictates the proper way to enjoy the theater: "The best in this kind are but shadows, and the worst are no worse if imagination amend them" (V.i.208-09). Theseus recognizes the players are interested in pleasing him and therefore he says, "If we imagine no worse of them than they of themselves, they may pass for excellent men" (V.i.211-12). In an eloquent description of art itself, Theseus explains that he chose Bottom's play because Bottom and his friends aimed to please Theseus, their audience. As Stephen Greenblatt points out, "In the theater, we confront a living representation of the complex relation between transfiguration and delusion" (Greenblatt, *The Norton Shakespeare* 373), which Theseus has resolved as a transformation that makes Bottom a more knowledgeable person after having been so close to the understanding of an animal during his dream. Bottom awakes and wants his dream full of synesthesia to be immortalized. Bottom knows "The eye of man hath not

heard, the ear of man hath not seen, man's hand is not able to taste, his tongue to conceive, nor his heart to report, what my dream was" (IV.i.209-12). He does know that he "will get Peter Quince to write a ballad of this dream: it shall be called 'Bottom's Dream,' because it hath no bottom" (IV.i.212-15), and it will ultimately be eternalized through art. Although the dream is caused by a potion that deceives the sense of sight upon awakening, the dream's significance for Bottom goes beyond sensory deception. Art is the immortalization of an experience, and Bottom wants to achieve this through a ballad, just as the play itself is a moment of Renaissance history frozen through artistic experience. Bottom's synesthesia gives the audience a glimpse of how a change like Bottom's ultimately affects someone after he has experienced a new perspective. If Shakespeare's audience saw "fairies on stage in *A Midsummer Night's Dream*, and not simply flesh and blood actors...it must be our imagination that makes amends" (Greenblatt, *The Norton Shakespeare* 374). If the audience is willing to see the play from the perspective of the four lovers who end the play in blissful happiness at their wedding alongside Theseus and Hippolyta, then it is clear that the audience's perspective can and does make amends through optical illusions in art and theater just as it does through convex mirrors or telescopic images. In the case of anamorphic art we are required to literally view an image from a different angle in order to fully appreciate the painting, but the theater's perspectival shift is in understanding an innovation.

When Oberon says to Titania, "We the globe can compass soon / Swifter than the wand'ring moon" (IV.i.94-95), Shakespeare's reference to circling the earth echoes Copernicus's, Harriot's, and Galileo's scientific inventions and theories before they were even accepted by all of society. Once more, Shakespeare speaks to the anxieties of

Renaissance culture: in this case, the overturning of Ptolemy's theory through the optical invention of the telescope. Shakespeare also used "Mirrors and perspective glasses—every means of distorting reality and deceiving the sight—[which] came to be of great interest. Without this interest the history of the stage would, however, have been very different" (Campbell, *Scenes and Machines* 149). In the final act of the play, the synthesis of the events that take place in the forest culminates with Hippolyta's understanding of the lovers' dream. It is disturbed by the fact that "their minds transfigur'd so together, / More witnesseth than fancy's images, / And grows to something of great constancy;" (V.i.24-26). The anamorphic elements of the end of the play exist in her belief that the lovers are telling the truth in the same way that a person admiring an anamorphic painting would need to acknowledge the distortions and disproportions of the painting in order to enjoy the painting in its intended form.

Just as "A cloth is used to cover the heavens and is painted in perspective" (Campbell, *Scenes and Machines* 152), so too is dramatic production heavily influenced by studies of perspective. When watching a dramatic production, the audience experiences "the logical sequence of perception and interpretation that springs out at the recipient of an anamorphic revelation" (Riehl 16) and has then partaken in a type of anamorphic experience even if they might not have imagined it in those terms. Just as the painting reveals a distorted image, so does the play, and in both instances these distortions are resolved through transformation when the viewer or character is able to find a new, more accurate perspective. In *A Midsummer Night's Dream* the characters are transformed by the end of the play and are able to see the world around them from a new perspective, which allows them to see things correctly.

Optical Deception in *The Merchant of Venice* and *Twelfth Night*

Aligned with the belief that sight is access to the truth, trust in outward appearances seems to have been a major concern in Shakespeare's England. In *The Merchant of Venice*, Bassanio attempts to solve Portia's father's riddle about which casket contains her picture with the hopes of marrying her. In doing so, he addresses the flaws in using sight as a source of truth. He begins with a comment on the unreliability of outward beauty when choosing among the gold, silver, and lead caskets. He says, "So may the outward shows be least themselves. / The world is still deceived with ornament" (III.ii.73-74). He goes on to address the deception of the senses with the easily deceived sense of hearing:

In law, what plea so tainted and corrupt

But, being seasoned with a gracious voice,

Obscures the show of evil? (III.ii.75-77)

Bassanio furthers his discussion by addressing the misuse of religion as evidence for truth. He says that with regard to religion, "What damned error but some sober brow / Will bless it and approve it with a text" (III.ii.778-79) that only hides the truth of the circumstance. In the same scene, Bassanio finds "Fair Portia's counterfeit! / What demigod / Hath come so near creation? Move these eyes? (III.ii.118-20) and criticizes the painter's inability to paint Portia's eyes accurately. He says, "but her eyes— / How could he see to do them? having made one, / Methinks it should have power to steal both his / And leave itself unfurnished" (III.ii.127-30). The painter was unable to replicate Portia's beauty: "Yet look how far / The substance of my praise doth wrong this shadow / In underprizing it, so far this shadow / Doth limp behind the substance" (III.ii.130-33). This

is reminiscent of the persona of Sonnet 24 who cannot show his love for the subject of his painting in the painting itself. Ultimately, he does win Portia as his wife.

Shortly after, Portia disguises herself as a man in order to help Bassanio out of a debt. She says to Nerissa, "When we are both accoutered like young men" (III.iv.64) she will be a more convincing boy because she will not only trick Bassanio with her disguise, she will also "speak between the change of a man and boy / With a reed voice, and turn two mincing steps / into a manly stride" (III.iv.67-69). The plan of optical deception is strengthened by the addition of a disguised voice as well. Disguised as Balthazar, Portia hears Bassanio say, "But life itself, my wife, and all the world / Are not with me esteemed above thy life. / I would lose all—ay, sacrifice them all / Here to this devil—to deliver you" (IV.i.275-78). Bassanio has been tricked by her disguise, which allows Portia to scold him, "Your wife would give you little thanks for that / If she were by to hear you make the offer" (IV.i.279-80). She tells Bassanio that her "mind was never yet more mercenary. / I pray you, know me when we meet again" (IV.i.412-13) to set up her later reveal that it was she who was pretending to be Balthazar. To secure the opportunity to prove that it was she who saved Bassanio, she says, "And for your love, I'll take this ring from you" (IV.i.423). Bassanio is fooled by the disguise, but wishes to stay faithful to Portia because he promised her that he "should neither sell nor give nor lose it" (IV.i.439). Even though he gives it away, Portia reveals herself to her husband eventually after teaching him a lesson about loyalty. Bassanio also wonders, "Were you the doctor and I knew you not?" (V.i.286). He acknowledges that his sense of sight perceived a doctor and that he was deceived by Portia's disguise and her ability to twist the words of the law. Nerissa's husband Gratiano is fooled in the same way and gives

away his ring (this one is engraved) as well. Nerissa also tricked Gratiano through a disguise as a clerk and is able to teach him the same lesson as Portia teaches Bassanio. Both Gratiano and Bassanio's new perspective once the optical deception is removed is for the better.

Confidence in reason alone or in the sense of sight alone is what gets Shakespeare's characters into trouble when they trust conversations they have with a person in disguise solely because the disguised person fits the part of the role he is playing. The delicate combination of sensory perception and of reason is a recipe that takes skills and analysis to perfect. This mixture of the avenues of access to the truth is often attended to in his plays because the sense of sight cannot be trusted.

Once again, Shakespearean comedy provides an avenue for circumstantial sensory deception. In *Twelfth Night*, while Malvolio is fantasizing about being with Olivia, he imagines, "calling my officer about me, in my branched velvet gown, having come from a daybed, where I have left Olivia sleeping—" (II.v.42-44). In his daydream, his attire, an embroidered velvet gown, implies that he is of nobility, while he is only a steward.

A further example of the frequent deception of sight in *Twelfth Night* is when Antonio makes an astute comment about the fact that beauty on the outside is often deceiving, because "Virtue is beauty, but the beauteous evil / Are empty trunks o'erflourished by the devil" (III.iv.336-37). Antonio is deceived again when he confuses his friend Sebastian with Viola, Sebastian's twin, who is disguised as the servant Cesario. Antonio tells Orsino that Sebastian (who was really Viola):

Where being apprehended, his false cunning,

(Not meaning to partake with me in danger)

Taught him to face me out of his acquaintance (V.i.79-81)

Sebastian realizes that “There’s something in’t / That is deceivable” (IV.iii.20-21) when he uses his eyesight to test reality: “This is the air, that is the glorious sun. / This pearl she gave me, I do feel’t and see’t” (IV.iii.1-2). His access to the truth is through his sense of sight and his sense of touch. However, his recognition that something is wrong because “my soul disputes well with my sense / That this may be some error but no madness” (IV.iii.9-10) initially begins because he knows that his senses are being deceived. His acknowledgement of this deception is the first step into the ability to transform his perspective.

Antonio’s lines are addressing the deception of sight as a path to the truth of someone’s interior personal qualities. Shakespeare seems to have been intrigued by discoveries of a more precise access to the truth of the universe, the combination of sight and reason addressed earlier, which is seen in *Twelfth Night*. Given the fact that research on lens advancement had been in practice for the past three hundred years, it seems likely that Shakespeare would have been familiar with this research (see Guenther). The new optical inventions like the telescope and the usage of optical illusions in art would have created a resurgence of inventions that use lenses to enhance or alter natural sight in some way. In *Twelfth Night*, he was clearly suggesting that the outward truth that humans so readily believe is often not the truth of the inner person. Viola trusts the captain who wants to help her into her disguise:

And though that nature with a beauteous wall

Doth oft close in pollution, yet of thee

I will believe thou hast a mind that suits

With this thy fair and outward character. (I.ii.44-47)

She acknowledges that her sense of sight might be being deceived because the captain is attractive and outward appearances are often misleading, but she trusts him anyway because she believes his offer to help shows that he is a good person. Viola's decision to trust the captain based on his behavior and her use of the combination of reason and sight turns out to be the right one. This logic is recognized in the bent stick in water for instance, which the audience knows is not actually bent; reason and sight combine to acknowledge the optical deception.

The cliché "seeing is believing" does not hold its ground by itself in Shakespeare's comedies, because Shakespeare plays upon the "if" of complicated situations. As discussed previously, the deception of sight was readily accepted as a flaw of human perception and thus needed the support of reason to make an accurate judgment about something one saw with his eyes. A further example from the end of *Twelfth Night* will illuminate this truth: Orsino says, "One face, one voice, one habit, and two persons, / A natural perspective, that is, and is not" (V.i.212-13). Orsino sees this optical illusion in what appears to be two versions of Sebastian. The words "natural perspective" would have followed a trend in natural history in early modern England. At that time, historical record was obtained through cataloguing of information and organizing it (Jalobeanu 204; see also Northrop Frye's *A Natural Perspective: The Development of Shakespearean Comedy and Romance*). The usage of this phrase implies this process of reasoning that goes on in one's mind when one's sense of sight is deceived. Here Orsino is cataloguing what appears to be two different people who are both Sebastian. He is acknowledging that his sense of sight is being deceived.

Both *The Merchant of Venice* and *Twelfth Night* contain examples of how the sense of sight cannot be trusted on its own. The optical confusion is resolved in both cases by the end of the play and the message to the audience is to be wary of trusting one's eyesight as the source of truth. These plays echo the similar experiences of the characters in *The Comedy of Errors* and *A Midsummer Night's Dream* who move beyond their original state at the start of the play in the same way that Shakespeare's audience would move beyond the perspective of a world without scientific inventions to a new, more scientifically advanced world.

Ocular Proof in *Othello*

With regard to optical deception, *Othello* is the Shakespearean tragedy that most overtly addresses deception. However, the mistake Othello makes is that he thinks that what he sees *accurately* is true. He has a mistaken reliance on plain sight but has not visually misperceived anything. That is, his perspective on the handkerchief is not inaccurate. He does accurately perceive its presence, but he inaccurately interprets his perception to mean that Desdemona has been unfaithful. Ocular proof in *Othello* is just as significant as optical elements in other plays even though it does not always fit the previous arguments made about misperception in which a character is inaccurately seeing what is in front of him, whether it is due to disguise or to a spell. Othello doesn't understand the equation of sight and truth; he takes his natural sight as accurate truth.

It is of course through "ocular proof" that Othello comes to believe Desdemona has been unfaithful. The evidence of infidelity is the handkerchief Iago claims Desdemona had given Cassio. The irony lies in the fact that Othello incorrectly assumes Desdemona has cheated on him based on a conversation he witnesses between Desdemona and Cassio. From the start of the play Othello relies on Iago for accurate perception. He says to Iago, "But look, what lights come yond?" (I.ii.28). Iago identifies them as Cassio and his friends, but not before Othello can ask "Is it they?" (I.ii.32). Shortly after, Iago assures Othello that "It is Brabantio: general, be advised" (I.ii.55). It is possible that Othello relies on Iago for clarity of sight. Othello's lack of accurate perspective is not the crux of his ocular weakness, but his reliance upon Iago for accurate "ocular proof" certainly is the cause of misperception of his wife's infidelity.

Othello's understanding of truth is gained through the eyes. His understanding of Desdemona's relationship, or lack thereof, with Cassio is also influenced by Iago's constant reassurance that "I cannot think it, / That he would steal away so guilty-like, / Seeing you coming" (III.iii.38-40) and "Why then I think Cassio's an honest man" (III.iii.132). Iago also tells Othello that "In sleep I heard [Cassio] say 'Sweet Desdemona, / Let us be wary, let us hide our loves,'" (III.iii.421-22). When he contemplates whether or not Iago is telling the truth about Desdemona's infidelity, Othello says, "What sense had I of her stolen hours of lust? / I saw't not, thought it not, it harmed not me, / I slept the next night well" (III.iii.341-43). It is evident that had Othello seen Desdemona give the handkerchief away, he would have been grossly affected both mentally and physically. As previously mentioned, Othello asks Iago to "give me the ocular proof" (III.iii.363) that would confirm Desdemona had slept with Cassio. Even in his sadistic plan to sabotage Othello's marriage, Iago relies on the eyes as the presenter of the truth: "Nay, yet be wise, yet we see nothing done" (III.iii.435). Othello still returns to the eyes when he asks Emilia, "You have seen nothing, then?" (IV.i.1). As Desdemona fights for her husband's mercy just before she is murdered, Othello reverts to the truth via the eyes. He says, "By heaven, I saw my handkerchief in's hand!" (V.ii.62) and three lines later repeats, "I saw the handkerchief" (V.ii.65) only to repeat the same lines again, "I saw it in his hand, / It was a handkerchief, an antique token / My father gave my mother" (V.ii.213-15). This overt dialogue about the eyes as access to the truth is not found in the plays previously discussed. *Othello* is another demonstration of the influence of optics and perspective on Shakespearean drama. In the last few lines of the play Lodovico references the literal deathbed where Desdemona and Othello lie as "The object [which]

poisons sight, / Let it be hid" (V.ii.362-63). There are certain sights that are unpleasant to the eye because they are disturbing. There may also be a secondary meaning here that would allude to the entire play's plot: the scene of such lack of sight is offensive to both the characters and the audience. The connection to the audience requires an accurate perspective, which makes the chaotic misunderstandings in the play an anamorphic example of poetic justice.

There are dangers in trusting one's eyes, as the eyes do not always have an accurate perspective on reality. Anamorphic art demonstrates this quite literal stretch of the truth in its perspectival images just as optical scientific inventions serve as proof that the naked eye often needs the help of lenses in order to access reality more effectively. *Othello* warns the audience not to trust what one sees without first gaining accurate perspective. It is a play that puts up a mirror to the audience to reflect upon their reliance on the sense of sight as a source of truth.

The mirror is a paradoxical image but is for some characters a means of discovering optical truth. The optical reference of a vanishing point might just be the audience. One way of connecting anamorphosis to Shakespearean drama is to consider that "Shakespeare creates a stage version of linear perspective and creates a palpable, if irretrievable, interiority of character and stage-space, a vanishing point of substance and meaning" (Mead 255). This way of thinking can also be applied to the audience as a member of the performance. The audience is also transformed at the end of the play.

As in all dramatic productions, it is the audience's participation in the message of the play that finalizes the success of the performance. This participation includes at its very foundation the audience's ability to view the stage and the cast performing the play

and also gives the audience the responsibility to complete an anamorphic experience. Their understanding of the play creates a third angle, one outside of those onstage between the actors, and thus requires a certain perspective for accurate understanding.

Othello is a little different from the optical misperception that is present in the comedies because he relies on sight as access to the truth and accurately perceives the “ocular proof” in the trap that Iago sets for him. The examination of *Othello* illuminates the usage of optical distortion in Shakespearean drama in that the tragedy results from complications of optical clarity. They mostly clearly demonstrate the ease in which the sense of sight can be manipulated and are thus the culminating productions in this research.

Shakespeare and Optics

Shakespearean drama was influenced by the rise in popularity of illusionist art and advancements in optical technology, which led to many instances of optical deception in dramatic productions. The Elizabethan community in which these developments were constructed had a new sense of reality after optic illusions distorted images in art and early versions of the telescope gave access to the moon and the stars. This culture would not have expected to see “Renaissance artists...cast off the authority of a tradition that had given the written word precedence over the experience of the senses” (Ackerman 125). That is, innovative artists and scientists used senses as avenues for truth rather than written forms of truth like the Bible; this channeled new inventions like lens manipulation, anamorphic art, and the later invention of the telescope.

The motivation of Renaissance artists and scientists to advance their work was to create finished products worthy of observation and analysis. The field of optics joined art and science quite directly. Renaissance artists were able to use optics to create a technique that conveyed three-dimensional images on a two-dimensional space and seemingly distorted images into clear pictures when seen from the correct perspective.

Drama is the ideal form for exploring collective optical anxieties because it is built upon an actor pretending to be someone he is not. This characteristic of drama becomes even more complex when there are twins, disguised characters, and mirrors involved.

When reading Shakespeare we have access to the sensory world in which he lived and can consider what aspects of sensory deception, particularly that of sight, were influenced by the culture in which Shakespearean drama developed. It is clear that illusion was a literary device in his writing that corresponded to his contemporaries who manipulated

optical perception in art and science. Shakespeare's approach to drama is well described by Maquerlot in that it mimics the description of a kaleidoscope. He writes that Shakespeare's writing is

all-inclusive; his eye probes all around the object, catching its multifarious facets in a prismatic vision, setting each single point of view against the many, revealing the fragility of appearances, and paradoxically allowing glimpses of a reality that extends far beyond the reflections we receive of it and the interpretations we give it.

(Maquerlot 69)

Shakespeare's writing brings a new perspective in each performance. The theater is a venue in which to explore a multifaceted style of writing, and the drama of anamorphosis is one aspect of optical misperception that appears in Shakespearean plays. It has three acts: "puzzlement, recognition, and meditation. Once the anamorphic process of optical clarity is complete, and the viewer sees the distorted image from the proper perspective, the content demands to be processed mentally. The implication that the reader or viewer is left with is intellectual rather than visual; it is a challenge to articulate the connection between the two images" (Riehl 161-62). The audience controls the final stage of the art form through understanding of the dramatic production. The new perspective that the audience has then allows for a proper understanding of the intended message of each play.

One of the most important involvements that Renaissance artists had in science was recognition of a new perspective in the world and its connection to its audience. It was impressive for humans to recreate reality through optical illusion in art as this simultaneously underscored how sensory access to truth was easily distorted.

Shakespeare's dramatic productions are an avenue for manifestations of the popularity of optical deception, whether through anxiety or intrigue, in the Renaissance. His plays provide a new perspective with which to see the world.

Bibliography

- Ackerman, John. "Artists in Renaissance Science." *Science and the Arts in the Renaissance*. Ed. John W. Shirley and F. David Hoeniger. Washington: Folger Shakespeare Library, 1985. Print.
- Bunch, Bryan and Alexander Hellemans. *History of Science and Technology*. Houghton Mifflin Company, 2004. Print.
- Calderwood, James L. "A Midsummer Night's Dream: Anamorphism and Theseus' Dream." *Modern Critical Interpretation: William Shakespeare's A Midsummer Night's Dream—New Edition*. Ed. Harold Bloom. New York: Infobase Publishing, 2010. Print.
- Campbell, Lily Bess. *Scenes And Machines On The English Stage During The Renaissance: A Classical Revival*. 1923 Cambridge University Press. New York: Barnes and Noble, Inc, 1960. Print.
- . *Shakespeare's "Histories": Mirrors of Elizabethan Policy*. San Marino, CA: The Huntington Library, 1947. Print.
- Classen, Constance. *Worlds of Sense: Exploring the Senses in History and Across Cultures*. New York and London: Routledge, 1993. Print.
- Coleridge, Samuel Taylor. *Shakespearean Criticism*. Ed. T. M. Raysor. London: J.M. Dent & Sons, Everyman's Library, 1960. Print.
- Cust, Lionel. "Painting, Sculpture, and Engraving. *Shakespeare's England: An Account of The Life and Manners of his Age Volume II*. Clarendon Press Oxford, 1926. 1-14. Print.
- Dowden, Edward. Life of Shakespeare and General Introduction. *The Works of William*

- Shakespeare*. By William Shakespeare. New York: Scribner and Welford, 1890. xvii-lxxii. Print.
- Dugan, Holly. "Shakespeare and the Senses." *Literature Compass* 6.3 (2009): 726-40. Print.
- Euclid. "The Optics of Euclid." Trans. Harry E. Burton. *Journal of the Optical Society of America* 35.5 (1945): 357-72). Web. 11 Jan. 2014.
- Forker, Charles R. Introduction. *King Richard II*. By William Shakespeare. 2002. Arden 3rd ed. London: Thompson Learning, 2005. 1-169. Print.
- Frye, Northrop. *A Natural Perspective: The Development of Shakespearean Comedy and Romance*. New York: Columbia University Press, 1965. Print.
- Gibbons, Brian. *The New Cambridge Shakespeare: The Sonnets*. Cambridge: Cambridge University Press, 1996. Print.
- Greenblatt, Stephen, Walter Cohen, Jean E. Howard, and Katharine Eisaman. *The Norton Shakespeare Comedies: Based on the Oxford Edition*. New York: W.W. Norton & Company, 2008. Print.
- . *The Swerve: How the World Became Modern*. New York: W.W. Norton and Company, Inc, 2011. Print.
- Guenther, Arthur H. "Archeological Optics." *International Trends in Applied Optics*. Bellingham, Washington: SPIE—The International Society for Optical Engineering. 2002. Print.
- Habib, Imtiaz H. *Shakespeare's Pluralistic Concepts of Character: A Study in Dramatic Anamorphism*. Cranbury: Associated University Press, 1993. Print.
- Hilliard, Nicholas and Edward Norgate. *A Treatise Concerning the Arte of Limning*. Ed.

- R. K. R. Thornton and T. G. S. Cain. Manchester: Carcanet New Press, 1980.
Print.
- Honigmann, E.A.J. Introduction. *Othello*. By William Shakespeare. 2003. 3rd ed. London: Thompson Learning, 2003. 1-111. Print.
- Hooper, Wilfrid. "The Tudor Sumptuary Laws." *The English Historical Review* 30.119 (July 1915): 433-49. Web. 17 Dec. 2013.
- Howard, Ian P. and Brian Rogers. "Historical Background." *Perceiving in Depth: Basic Mechanisms*. Oxford: Oxford University Press, 2012. Print.
- Ilardi, Vincent. *Renaissance Vision: From Spectacles to Telescopes*. Philadelphia: American Philosophical Society, 2007. Print.
- Jalobeanu, Dana. "Francis Bacon's Natural History and the Senecan Natural Histories of Early Modern Europe." *Early Science and Medicine* 17 (2012): 197-229. Web. 17 Dec. 2013.
- Kaufmann, Thomas DaCosta. *The Mastery of Nature: Aspects of Art, Science, and Humanism in the Renaissance*. Princeton: Princeton University Press, 1993. Print.
- Kenaan, Hagi. "The 'Unusual Character' of Holbein's 'Ambassadors'." *Artibus et Historiae* 23.46 (2002): 61-75. Web. 25 Mar. 2014.
- Leeman, Fred. *Hidden Images: Games of Perception, Anamorphic art, Illusion: from the Renaissance to present*. New York: H.N. Abrams, 1976. Print.
- Lewis, Cynthia. "'With Simular Proof Enough': Modes of Misperception in Cymbeline." *Studies in English Literature, 1500-1900* 31.2 (Spring 1991): 343-64. Web. 17 Nov. 2013.
- Lindberg, David C. and Nicholas H. Steneck. "The Sense of Vision and the Origins of

- Modern Science." *Science, Medicine and Society in the Renaissance*. Ed. Allen G. Debus. New York: Science History Publications, 1972. Print.
- Maquerlot, Jean-Pierre. *Shakespeare and the Mannerist tradition: A reading of five problem plays*. Cambridge: Cambridge University Press, 1995. Print.
- Mead, Stephen X. "Shakespeare's Play With Perspective: Sonnet 24, Hamlet, Lear." *Studies In Philology* 109.3 (2012): 225-57. *Literary Reference Center*. Web. 27 Aug. 2013.
- Morgan, Hiram. *Tyrone's Rebellion: The Outbreak of the Nine Years War in Tudor Ireland*. London: The Royal Historical Society, 1993. Print.
- Obstfeld, Raymond and Loretta, eds. *The Renaissance*. San Diego: Greenhaven Press, 2002. Print.
- Riehl, Anna. "Eying The Thought Awry: The Anamorphosis Of John Donne's Poetry." *English Literary Renaissance* 39.1 (2009): 141-162. *Literary Reference Center*. Web. 27 Aug. 2013.
- Shakespeare, William. *All's Well That Ends Well*. Arden 3rd ed. Ed. G.K. Hunter. London, Methuen and Co. Ltd., 1959. Print.
- . *A Midsummer Night's Dream*. Arden 2nd ed. Ed. Harold F. Brooks. London: A&C Black Publishers, Ltd., 1999. Print.
- . *King Lear*. Arden 3rd ed. Ed. R. A. Foakes. London: The Third Series Arden Shakespeare of Cengage, 1997. Print.
- . *King Richard II*. 2002. Arden 3rd ed. Ed. Charles R. Forker. London: Thompson Learning, 2005. Print.
- . *Othello*. Arden 3rd ed. Ed. E.A.J. Honigmann. London: Arden Shakespeare,

1997. Print.
- . *Shakespeare's Sonnets*. Arden 3rd ed. Ed. Katherine Duncan-Jones. London: Thomson Learning, 2007. Print.
- . *The Comedy of Errors*. 1962. Arden 2nd ed. Ed. R. A. Foakes. London: Arden Shakespeare, 2013. Print.
- . *Twelfth Night*, Arden 3rd ed. Ed. Keir Elam. London: The Third Series Arden Shakespeare of Cengage, 2008. Print.
- . *The Merchant of Venice*, Arden 3rd ed. Ed. John Drakakis. London: Arden Shakespeare, 2010. Print.
- Shickman, Allan. "The 'Perspective Glass' in Shakespeare's Richard II." *Studies in English Literature* 18.2 (1978): 217-228. Web. 10 Oct. 2013.
- Sider, Sandra. *Handbook to Life in Renaissance Europe*. New York: Facts on File, Inc., 2005. Print.
- Sidney, Philip. *An Apologie for Poetrie, 1595*. Ed. Edward Arber. London: A. Murray, 1595. Print.
- Topper, David. "On Anamorphosis: Setting Some Things Straight." *Leonardo* 33.2 (2000): 115-124. Web. 12 Jan. 2014.
- West, William N. "What's the Matter With Shakespeare?: Physics, Identity, Playing." *South Central Review* 26.1&2 (2009): 103-126. Web. 10 Oct. 2013.
- Zack, Naomi. "The *Via Media* and English Empiricism." *Bachelors of Science: Seventeenth-century Identity, Then and Now*. Philadelphia: Temple University Press, 1996. Print.